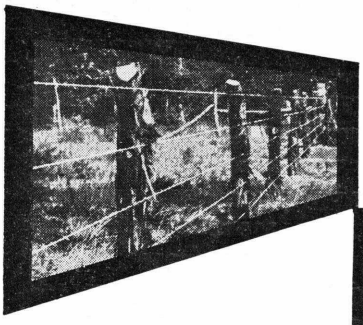
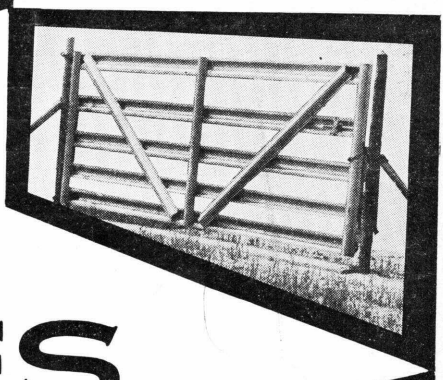
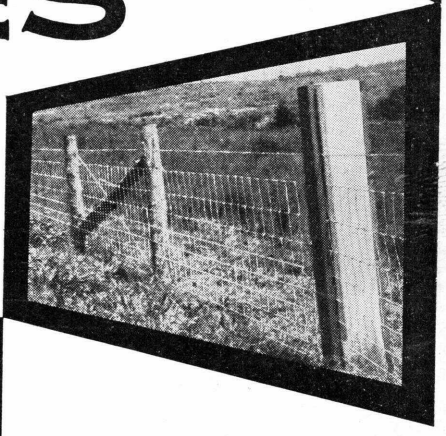
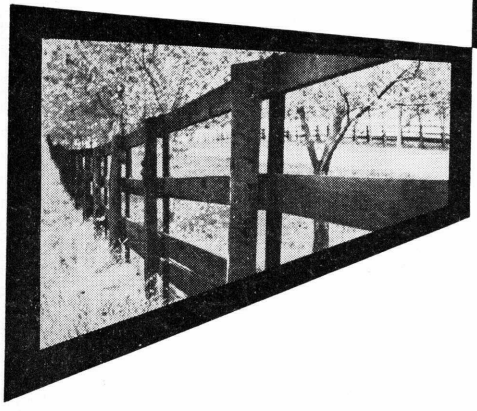




FARM FENCES





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CONTENTS

Growth Through Agricultural Progress

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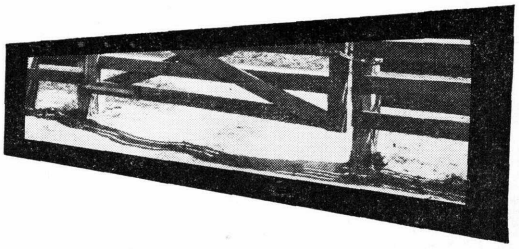
FARM FENCES



Prepared by Agricultural Engineering Research Division
Agricultural Research Service

Farm fences include rail, board, stone, steel wire, and electric. Steel-wire fencing, in one of the various forms, is the most widely used.

In determining the kind of fence to build, you need to consider—

• *Land value.*—Fences around valuable land should occupy as little space as possible. Wire fences generally take up the least amount of space. With marginal, cut-over, or low-priced land, cost of the fence rather than type will be the important factor.

• *Use.*—Wire fences are commonly used for stock fencing. Electric fences are convenient for temporary fencing where permanent fences would be expensive or perhaps not wanted. Rail, stone, and board fences, well designed and properly constructed, can greatly improve the appearance of the farm.

• *Availability of materials.*—Wood or stone may be readily available for fencing. In such case, cost may justify the use of wood or stone fences instead of other kinds.

• *Maintenance.* — Permanent fences should be made of good materials and be well built. Cheap materials and poor construction lead to high maintenance costs and short life. Labor cost is high for clearing brush and weeds from stone and rail fences, in particular.

• *Fencing laws.*—Most States have laws defining what constitutes a legal partition fence or a fence along a highway or railway.

KINDS OF FENCES

Rail

The zigzag rail fence, also known as the worm or Virginia, is built 6 to 11 rails high (fig. 1). The rails are usually 11 feet long and are laid at an angle so that each section advances the fence 8 feet. Braces or stakes hold the rails in place and stabilize the fence. Base width should be 4½ to 5 feet for the fence to withstand high winds. (Two adjoining sections of fence form a triangle. Base width is the distance from the apex—junction of the two sections—to the center of the imaginary base line.) Placing the heaviest rails on top gives added weight and reduces the number of rails broken by people climbing over the fence.

Straight rail fences require fewer rails, take up less ground, and are easier to keep clean than zigzag fences.

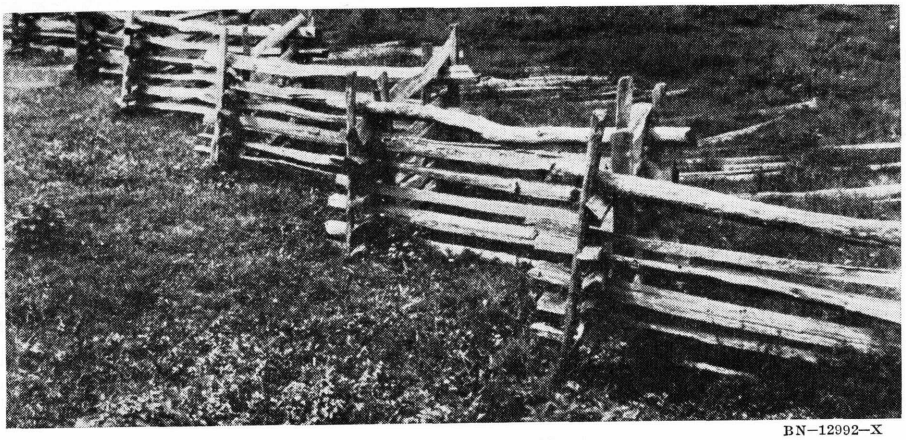


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Figure 1.—Zigzag rail fence.

Board

Board fences (fig. 2) are commonly used where horses are raised extensively. When painted white or whitewashed, they make an attractive framing for the farmstead.

Planks well spiked or bolted to substantial posts make a safe paddock or barnlot fence. Planks should be on the paddock side of the fence so that the stock will not loosen them.

Boards 1 inch thick and 6 to 8 inches wide are commonly used for board fences. Nail the boards with tenpenny galvanized or cut nails.

Figure 2 (right) shows boards held in place by cleats. Sixty-penny spikes driven through holes bored in the cleats hold the cleats in place. In case of fire the cleats can be loosened and the boards removed. The double board at the bottom lessens the danger of injury to horses' legs.

Stone

Stone fences vary in design; two styles are shown in figure 3.

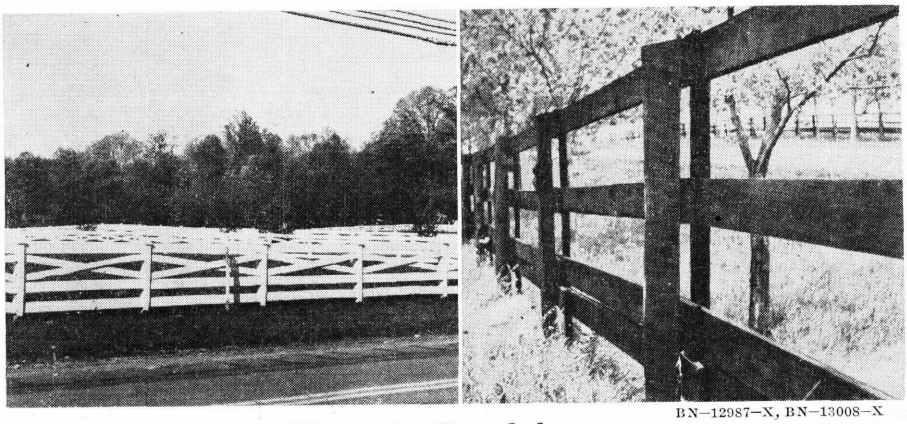

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Figure 2.—Board fences.

Stone fences are usually 3½ to 5 feet high. They are made with flat stones, quarried stone, or field boulders.

Stones may be laid loose or with mortar joints. Laying a loose-stone fence requires considerable skill, because it is hard to properly tie and chink large stones with small ones. Round stones should be laid with mortar joints.

Stone fences should be built on a substantial, well-drained foundation.

Steel Wire

Steel-wire fencing includes barbed wire, barbless or smooth wire, woven wire, and a combination of barbed and woven wire.

Most steel-wire fencing is manufactured under Federal Government standards. These standards limit the number of styles of fencing and provide the requirements for galvanizing (coating with zinc).

Barbed Wire

Six styles of standard and three styles of high-tensile-strength barbed wire are available.

Styles of barbed wire differ in shape and number of points of the barb, spacing of barbs, and size of wires. Selection is generally a matter of personal preference.

The wire is sold in 80-rod spools. Price of a spool varies according to weight of the wire. Wire weight should be considered in selecting barbed wire, because heavier wire lasts longer and has lower maintenance cost.

Figure 4 shows a well-built barbed-wire fence. Fence stays—wood slats or twisted galvanized wire—are sometimes used between posts. They hold wires at the proper spacing and, therefore, permit wider spacing of posts.

Barbless or Smooth Wire

Standard two-strand twisted barbless or smooth wire is sometimes used in southern areas for cattle fencing, because of the danger of screw-worm infection in open wounds inflicted by barbed wire. It is also used for horse enclosures.

Woven-Wire Field or Stock Fencing

Woven-wire field or stock fencing is available in eight principal

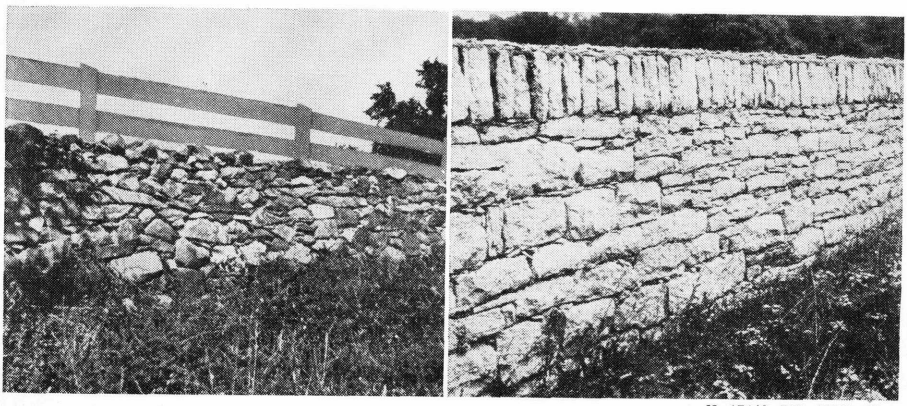

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***Figure 3.*—Stone fences. *Left:* Combination board and loose stone fence. *Right:* Limestone fence with an occasional mortar tie and a top dressing.**

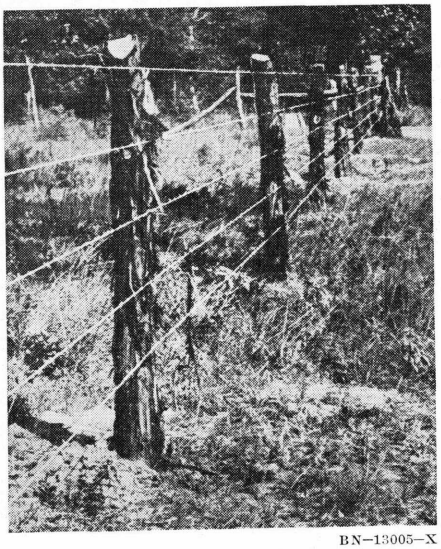

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***Figure 4.*—A well-built barbed-wire fence suitable for cattle.**

standard styles. Figure 5 shows the five most commonly used styles—numbers 1155, 1047, 939, 832, and 726. The first two digits in four-digit style numbers, and the first digit in three-digit numbers, indicate the number of horizontal or line wires in the fencing. The last two digits indicate fence height in inches.

The three other styles are 949, 845, and 635. They are the same as the 1155 fencing except that two bottom wires are omitted from 949, three from 845, and five from 635.

Field or stock fencing (fig. 6) is made in different weights, the weight depending on the gage of the wires. Top and bottom line wires are usually heavier than stay and intermediate line wires, which usually are of the same gage. Heavier fencing gives longer service and has lower maintenance costs.

Field or stock fencing is sold in 20-rod rolls. Stay wires are spaced 6 or 12 inches apart and may be stiff or flexible. Stiff stay wires tend to keep the fence more erect; flexible wires absorb shocks more readily.

Good fencing has tension curves built into the line wires. The curves permit expansion and contraction of the fence with temperature changes, serve as a guide in stretching, allow adjustment to terrain, and permit shock to the fence without damage to posts.

Woven-Wire Poultry Fencing

Woven-wire poultry fencing includes poultry-garden fencing and chick fencing. Wire fabric or netting is sometimes used for poultry fencing, but is not as satisfactory as the heavier material.

Poultry-garden fencing is made in two standard styles—2158 and 1948. Chick fencing is made in three standard styles—2672, 2360, and 2048. As with field or stock fencing, the first two digits in the style numbers indicate the number of line wires and the last two digits indicate fence height in inches.

Poultry-garden and chick fencings, which are sold in 10-rod rolls, are made in different weights. Heavier fencing gives longer service and has lower maintenance costs. Stay wires in these fencings are spaced 6 inches apart.

Galvanized wire fabric or netting is made with 1- or 2-inch hexagonal mesh and in nine heights ranging from 12 to 72 inches. Though sometimes used as temporary fencing for small poultry yards, it is used mainly for windows and other purposes in poultry houses.

Specific Uses

Specific need, such as the type of stock to be fenced in, determines the type or style of steel-wire fencing to use.

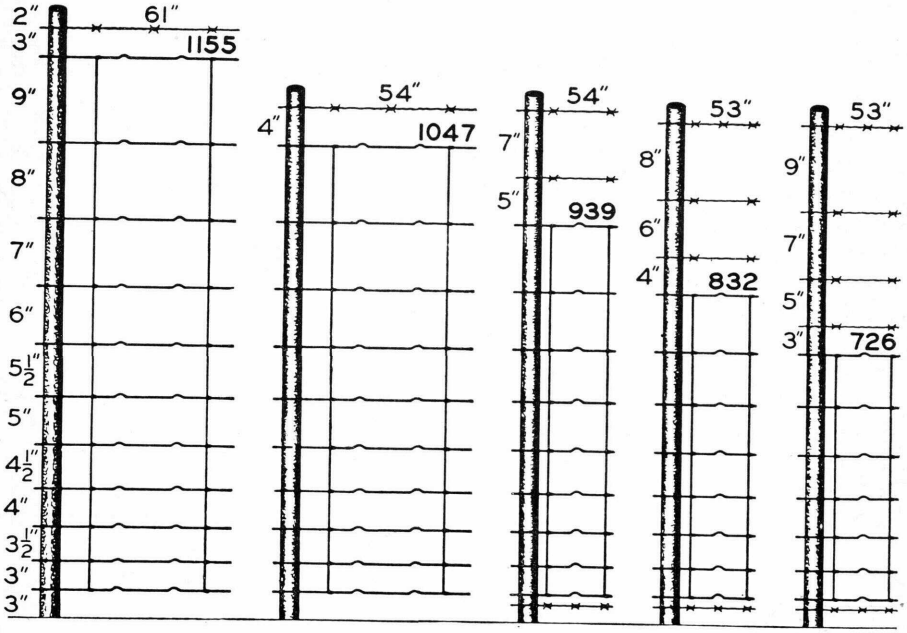

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***Figure 5.*—Standard types of woven-wire fencing combined with barbed wire. In *A* and *B*, stay wires are spaced 12 inches apart. In *C*, *D*, and *E*, stay wires are spaced 6 inches apart.**

In some cases horses, cattle, sheep, and hogs may be in the same field. You would need one of the following:

1. A 55- or 47-inch fence with one barbed wire above (fig. 5, *A* or *B*).

2. A 26-inch fence with four barbed wires above (fig. 5, *E*).

3. A 32-inch fence with three barbed wires above (fig. 5, *D*).

Hog fences.—Permanent hog fences are usually a combination of woven and barbed wire—the types shown in figure 5, *C*, *D*, and *E*, but without the barbed wire above. Barbed wire at the bottom, 2 or 3 inches aboveground, discourages rooting. The 39-inch fence may be damaged by persons climbing over it; 32-inch fence can be climbed

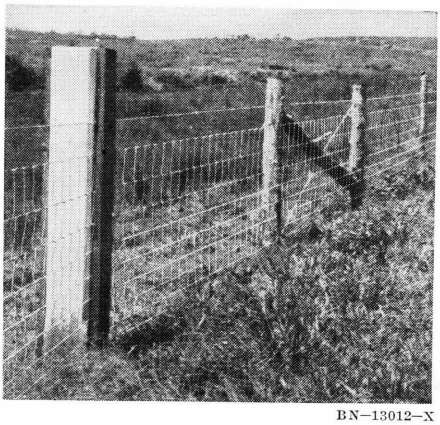

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***Figure 6.*—A well-built woven-wire fence. Braced line posts will support several rods of fencing on each side. Where a fence angles slightly, a concrete post (at left) will prevent the wire from pulling posts out of line.**

without damage. Fencing with 11-gage stay wires will be more satisfactory and last longer than fencing with lighter stay wires.

A temporary fence of woven wire without barbed wire can be used to confine hogs while they are hogging down corn. A 26-inch fence is preferable because it may be easily rolled between corn rows.

Cattle fences.—Woven-wire fences 48 to 56 inches high are recommended for cattle.

Barbed-wire cattle fences between neighbors' properties should have five strands of wire spaced 9 inches apart with the bottom wire 12 inches above the ground. Fences dividing pastures on the same farm should have three strands of wire spaced 24, 36, and 48 inches above the ground.

In the Western States, large permanent cattle pastures are usually fenced with three strands of barbed wire. (Two strands are sometimes used in sections of low-priced land.) Such fences may not restrain all animals.

Sheep fences.—Woven wire fences are preferable for sheep; barbed wire tears the fleece. The fences shown in figure 5, *D* and *E*, are suitable. Standard woven-wire fencing is generally used for sheep, but lighter wire is sometimes used in semiarid and high-plateau regions.

Figure 7 shows a fence designed to protect sheep from dogs or coyotes. The extended wire at the top discourages dogs from jumping the fence. An apron of woven wire 18 inches wide along the ground will prevent predatory animals from burrowing beneath the fence. Fasten the apron to the fence wire and stake it down or weigh it down with rocks.

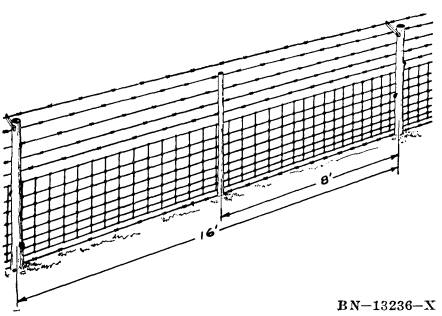

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***Figure 7.*—Fence for protecting sheep against dogs or coyotes.**

Electric

An electric fence (fig. 8) consists of one or more electrically charged wires usually supported by, but insulated from, wood or metal posts.

Such a fence is used chiefly to control cattle and horses, but is sometimes used for sheep and hogs.

Electric fences are used to supplement regular fences and as separate temporary fences. A single charged wire along the top or side of a regular fence will deter stock from breaking down the fence and permit the use of fences in poor condition. Barbed- and smooth-wire fences on semipermanent posts usually are more effective when one or more wires are charged.

Temporary electric fences with light-duty, portable posts can be used to control grazing stock and can be moved easily when necessary.

Design, installation, and use of electric fences must be in accordance with State and local ordinances and the manufacturer's instructions.

Use only controllers (fig. 8, right) that carry the approval of Underwriters' Laboratories (UL) or the Wisconsin State Industrial Commission. "Homemade" controllers with connections to A.C. power lines

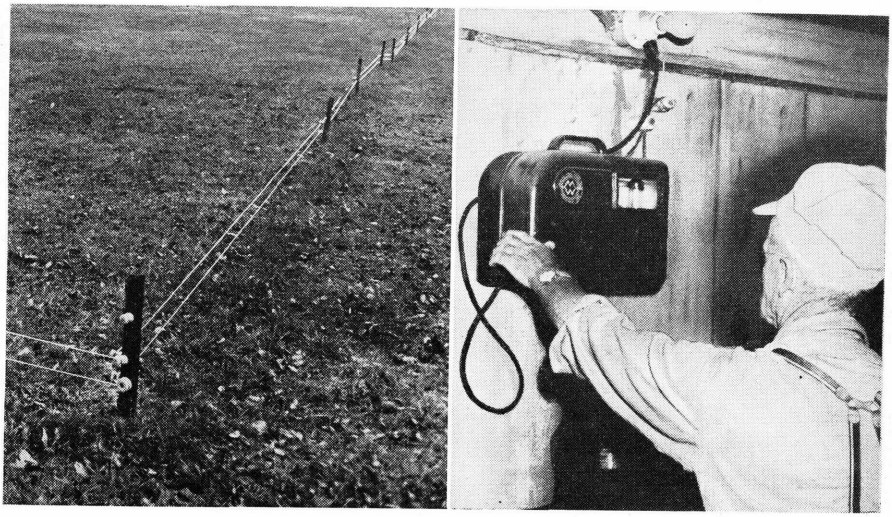

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Figure 8.—Left: **Electric fencing.** ***Right:*** **A well-designed and properly installed controller is required for safe operation.**

through current-limiting devices are extremely dangerous. Controllers usually are designed to operate on 115-volt power. Units are available that will operate on batteries and may be used in remote areas where electric service is not available. Locate the controller inside a building or otherwise protect it from the weather.

The wire or lead from the controller to the fence must be well insulated. An insulated wire used for electric service is not satisfactory unless used with electric-fence-type insulators. Insulators should be of good quality to prevent leakage of the electrical charge. Black pigmented polyethylene or glazed porcelain insulators meet the requirements.

Install lightning arrestors (other than those of the controller) to reduce possible damage by lightning, one of the causes of electric-fence failure.

Some animals may be somewhat resistant to shock from an electric fence. A chain around the animal's neck may help to transmit the shock. The chain should not touch the ground.

FENCEPOSTS

Wood, metal, and concrete posts are used in farm fencing. Where timber is plentiful, wood posts are used more than metal or concrete. Initial cost is important in selecting posts, but you should also consider durability and ease of erection and maintenance.

Wood

Osage-orange and black locust are the most durable wood posts, but they may not be available in all parts of the country. Most areas have other species that are suitable for posts if the posts are treated with a good preservative.

In many areas, farm woodland may be a good source of posts. State forestry departments can

recommend the best species for your area.

Low-cost wood posts often are not the cheapest in the long run. If posts do not last as long as the fence, maintenance or replacement costs can be high. You should use the most durable posts available or treat less durable posts with wood preservative.

Durability of untreated wood posts, even of decay-resistant species, depends largely on heartwood content. Select posts of mostly heartwood if they are not to be treated. Posts with a large proportion of sapwood should be treated regardless of species.

Untreated wood posts of different species divide into three classes according to durability:[1]

Class 1.—Woods that will probably last longer than 15 years:

Black locust
Osage-orange

Class 2.—Woods that will probably last 7 to 15 years:

Baldcypress
Catalpa
Cedar (various species)
Oak (white)
Redcedar (eastern or western)
Red mulberry
Redwood
Sassafras
Walnut (black)

Class 3.—Woods that will probably last 1 to 7 years:

Ash (various species)
Aspen (popple)
Balsam fir
Basswood
Beech
Birch (various species)
Boxelder
Butternut
Cottonwood
Douglas fir
Elm (various species)
Hackberry
Hemlock (eastern)
Honeylocust
Larch (western)
Maple (various species)
Oak (red)
Pine (various species)
Spruce (various species)
Sweetgum
Sycamore
Tamarack
Willow (various species)

[1] Estimates are for average durability of round posts 5 to 6 inches in diameter. Larger posts or split posts cut from large trees and having little sapwood should last longer.

Preservative Treatment

Pressure-treated posts—posts treated with preservative by commercial process—are available in most areas. Such posts are highly resistant to decay and insect damage and are usually superior to home-treated posts.

Home treatment of posts with preservative makes it possible to use home-grown wood otherwise unsuitable for posts. Various preservatives and methods are used to treat posts.[2] Cost can be reduced if two or more farmers purchase the necessary equipment jointly. Preservatives usually cost less per gallon when purchased in larger quantities.

Unnecessary Treatments

Seasoning, painting, setting in concrete, and other methods are sometimes mistakenly used to make posts last longer.

[2] Information on preservative treatment of posts may be obtained from your county agricultural agent or the U.S. Department of Agriculture, Washington 25, D.C.

Seasoning posts is of questionable value unless they are to be treated.

Painting generally does not prevent decay and sometimes may hasten it. However, painting posts improves the appearance of the fence and makes it easier to see.

Setting untreated posts in concrete is not recommended. The post may shrink from the concrete, leaving a crack for moisture to enter. However, with durable or treated posts, the stability and anchorage provided by the concrete may justify its use.

Sloping or tapering the top of a post so that rain or snow can readily drain off does not appreciably increase the life of the post.

The season of the year when wood is cut has no effect on decay resistance. However, posts cut in the spring peel easier, and peeling is recommended because the bark harbors insects and traps moisture that hasten decay.

Size

Line posts of Osage-orange or of wood that has been pressure treated may be as small as 2½ inches in diameter. Untreated posts of other species usually are 4, 5, or 6 inches in diameter. Gateposts and corner posts usually are 6 inches or more in diameter. Split posts should be at least 5 inches. Overall length will depend on the height of the fence—7, 7½, and 8 feet are common lengths. Length of gateposts, and the depth they are set in the ground, will depend on the height and weight of the gate.

Metal

Metal posts are made of rail, billet, and alloy steel. They are available either galvanized or painted. Galvanized posts are the most durable. However, tests show that posts brush painted with metallic zinc last almost as long and maintain a good appearance for 25 years. Tests show also that posts dip painted with lead and oil paint rust within 5 to 7 years.

Metal posts usually cost more than wood posts of a durable species or pressure-treated posts, but they have some advantages to offset the higher cost.

- If the soil is moist, they will protect stock against lightning by grounding the current.
- They are fireproof.
- They are light in weight, and, therefore, easily handled.
- They are easily driven into most soils, which reduces labor and cost of setting.

One disadvantage of metal posts is that stock crowding against the fence may bend them or force them out of line. Anchor plates bolted, clamped, or riveted to the base will tend to keep them in line.

Figure 9 shows some of the more common shapes of metal posts and the devices used to fasten wire to them.

In areas close to oilfields, boiler factories, or repair shops, used pipe may be available for fenceposts at reasonable cost. Pipe should be at least 1¾ inches in diameter for line posts and larger for corner posts. For heavy corner posts or gateposts, use pipe 6 to 8 inches in diameter and fill with concrete.

Cables run through eyes welded to metal posts make excellent lot fences where stock is closely confined. These open fences permit breezes to blow through the lot, resulting in a measurable increase in performance of beef cattle in hot climates.

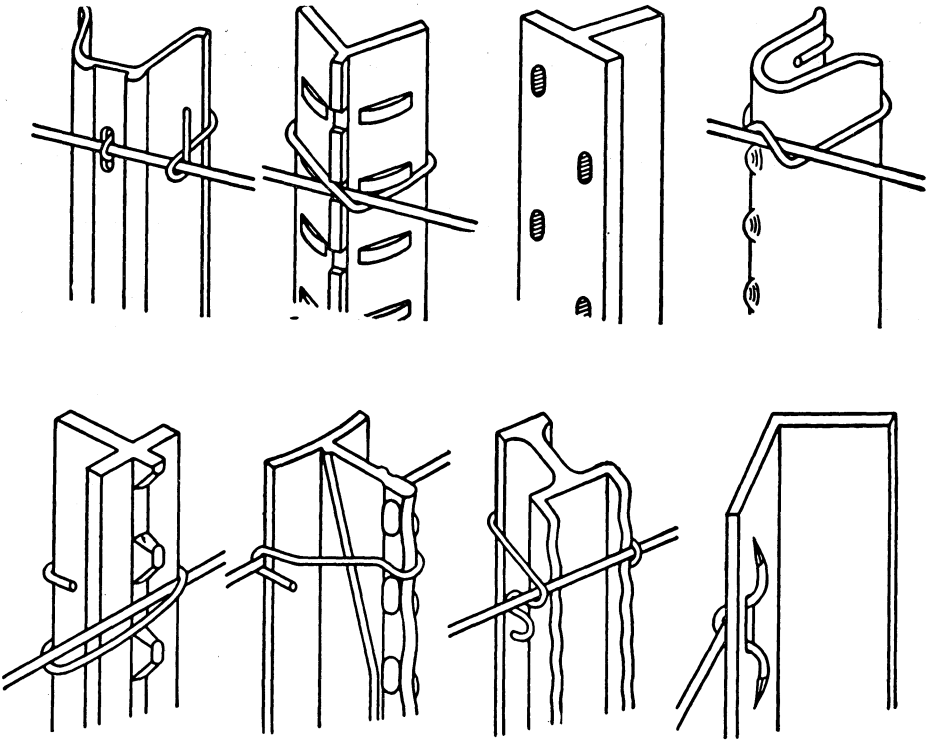

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Figure 9.—**Steel fenceposts and methods of fastening wire to them.**

Concrete

Concrete posts (fig. 6) give satisfactory service if made of good concrete and properly constructed.[3]

Concrete corner posts and gateposts are made in various sizes and shapes and are usually cast in place.

Special Types

In shallow or rocky soil it may not be possible to set posts in the ground. Aboveground posts (fig. 10) can be used.

[3] Information on using concrete on the farm may be obtained from your county agricultural agent or the U.S. Department of Agriculture, Washington 25, D.C.

CONSTRUCTION

Well-constructed fences give better service, last longer, and require less maintenance than poorly constructed ones. Take the necessary time to do a good job.

After you locate the fence line, clear the ground of stones, stumps, brush, trash, and other obstructions.

Spacing of Posts

Spacing of posts depends on the circumstances. Some of the best fences have a post spacing of 12 feet. Many field fences are built with posts spaced 1 rod (16½ feet) apart. In large pastures in the West, posts are sometimes spaced up

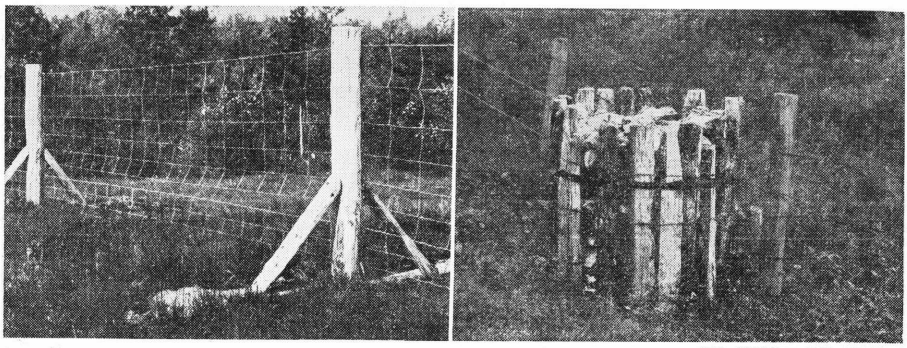

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***Figure 10.*—Aboveground posts. *Left:* Post set on sills and braced. *Right:* Rock-filled corner post or gatepost for stony land.**

to 50 feet apart. In such cases, wood stays or small posts are used to support the wire between posts.

For confining large animals in small lots or pastures, a post spacing of 8 feet is recommended. Closer post spacing is required for hogs than for sheep, although fence height may be the same for both.

Setting Posts

When setting posts, keep them alined by sighting along poles or holding them against a line or wire stretched between end or guide posts.

Line posts usually are set 2½ feet in the ground; end, corner, and brace posts, 3½ feet; and gateposts, 4 feet.

Posts may be driven into the ground or set in holes.

Steel posts and wood posts that have been sharpened are commonly driven. A 16-pound sleeve will drive steel posts satisfactorily in most soils. A steel sledge or wooden maul is generally used for driving wood posts. A driving cap is recommended when using a sledge to drive a steel post. Standing on a platform 2 or 3 feet above the ground will aid in driving posts.

Digging holes and tamping posts in place generally requires more labor than driving posts when all operations are manual. Hand augers or posthole diggers are generally used. Auger attachments are available for tractors (fig. 11). Such equipment can drill 20 times as many holes per hour as one man can do manually. Other motor-powered augers as well as motor-powered drivers are available.

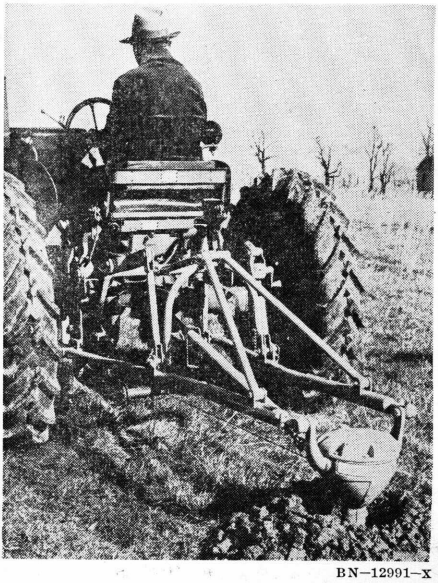

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***Figure 11.*—Auger (posthole digger) attachment for tractors.**

When setting posts in holes, keep them in alinement while replacing the dirt. Tamp the dirt frequently and well in backfilling to insure good anchorage of the post.

Bracing End and Corner Posts

End and corner posts are the foundation for a fence. Failure of these posts necessitates complete restretching of the fence. Good design and construction of end- and corner-post assemblies are, therefore, very important.

Figure 12 shows the principal types of bracing assemblies for end and corner posts. Double-span assemblies (*A*, *B*, and *C* in the illustration) have more than twice the strength of the single spans and only half the horizontal and vertical movement under heavy loads. Tests show that type *C* assembly is superior to *A* and *B*, and that *B* is superior to *A*.

The following minimum sizes for wood posts, braces, and tie wires are recommended for the bracing assemblies shown in figure 12.

Single spans:

Corner post	6-inch diameter
Brace post	5-inch diameter
Brace	4-inch diameter
Tie	2 double strands of No. 9-gage wire.

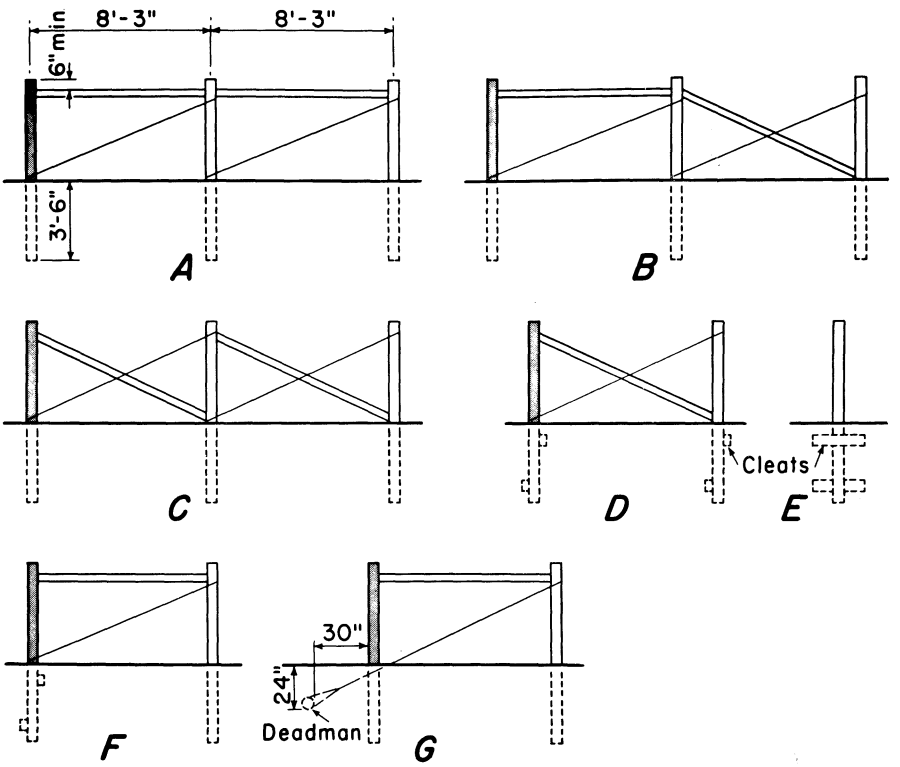

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Figure 12.—**Bracing assemblies for end and corner posts. (End or corner posts are shaded.)**

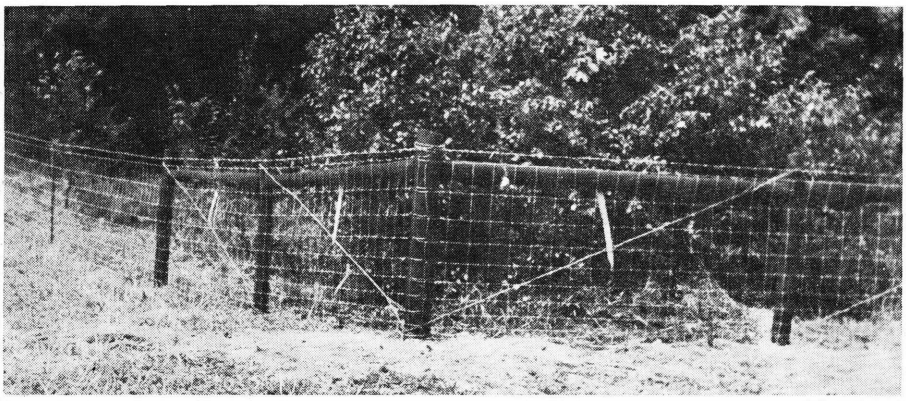

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***Figure 13.*—A well-constructed corner-post assembly.**

Double spans:

Corner post	5-inch diameter
Each brace post	4-inch diameter
Each brace	4-inch diameter
Each tie	2 double strands of No. 9-gage wire.

Set corner, end, and brace posts at least 3½ feet in the ground. Space brace posts a minimum of 8¼ feet apart. Securely fasten the braces and ties to the posts at the ground line and 6 to 12 inches from the top. Fasten each wire in the tie to the post with a staple nailed diagonally across the grain to avoid splitting. Figure 13 shows a well-constructed corner-post assembly.

Steel corner- and end-post assemblies require the same care in construction as wood ones.

Set steel corner and end posts in concrete, 3½ to 4 feet in the ground and below the frostline (fig. 14). Make the hole for pouring the concrete 18 inches square at the top and 20 inches square at the bottom. When pouring the concrete, hold the post in place with the top 1 inch out of plumb away from the direction the fence will be stretched. When the fence is stretched the post will be plumb.

Braces for steel posts must also be set in concrete. Attach them to the posts first so that you can properly locate the concrete pier. The pier should be 20 inches square at the top and bottom and 18 inches deep. The brace should enter the pier about 6 inches below the ground and should extend about 6 inches into the concrete.

On long stretches of fence, it is desirable to install steel corner posts at 40-rod intervals. Figure 15 shows the construction.

Allow all concrete to harden for at least 4 days before stretching the fence.

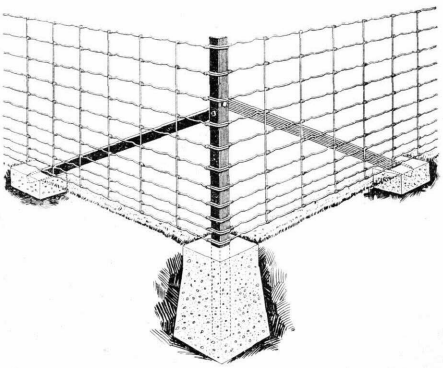

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***Figure 14.*—Steel corner and brace posts set in concrete.**

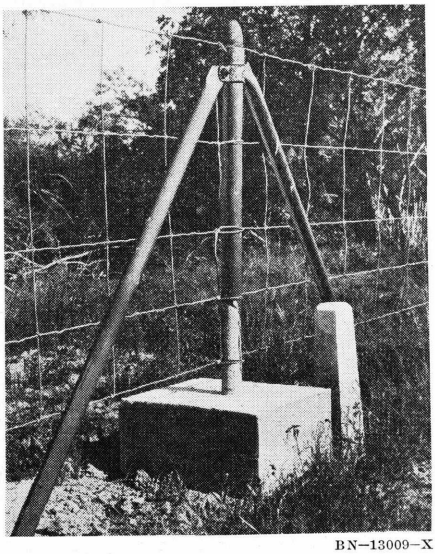

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Figure 15.—**Braced line posts increase the life of the fence.**

Anchoring Posts

Posts are anchored for better resistance against fence tension, impact of livestock, and frost heaving.

Steel posts are usually small in size and light in weight and unless anchored are easily pushed over or out of line by livestock. Figure 16 shows several types of anchors for steel posts.

Wood brace posts may be anchored by means of cleats on opposite sides of the post (fig. 12 *D*, *E*, and *F*). The lower cleats will be effective in resisting frost action as long as the bolts hold.

Tie wires may be anchored by means of a "deadman" (fig. 12, *G*) or a buried plate (fig. 17).

Posts set in low spots are subject to uplift from wire tension. They may be weighted down, set in concrete, or provided with cross cleats. Fence wire is sometimes weighted down at low spots between posts.

Splicing Wire

The Western Union splice is recommended for splicing wire fencing. It is easily made with the tool shown in figure 18, *A*. If stay wires are spaced 12 inches apart, you should have enough wire to make a good splice between them. If they are spaced 6 inches apart,

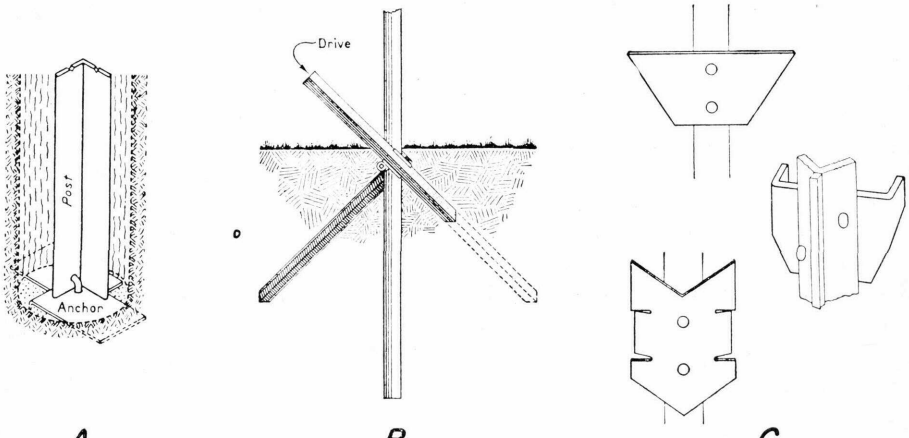

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Figure 16.—**Steel-post anchors: *A*, Anchor attached to bottom of post to resist frost action; *B*, steel angle irons driven into the ground anchor post; *C*, common types of steel-post anchors.**

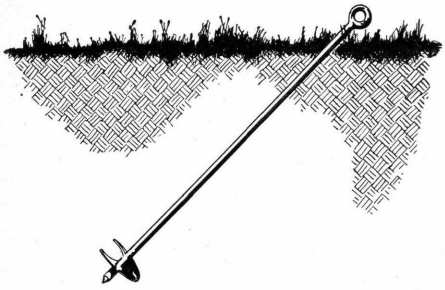

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***Figure 17.*—A buried-plate anchor.**

use the kind of splice shown in figure 19.

Stretching Woven Wire

Woven-wire fencing should not be stretched until all concrete for posts is properly set and the posts firmly embedded.

Use a strong stretcher with dependable clamps that will not slip. A single-jack stretcher is satisfactory for fencing 26 to 32 inches high. A double-jack stretcher should be used for higher fencing. The stretcher may be anchored to a convenient tree or to a temporary post.

Do not stretch fencing around a corner that changes direction more than 45°. Cut fence at that point and fasten it to the post. Do not fasten fencing to trees. Nail a board to the tree and staple fence to the board.

Set the roll of fencing on end 1 rod from the end or corner post. Unroll enough wire to make a wrap around the post and fasten back onto the fence.

Remove two or three stay wires, the number depending on the circumference of the post, and place the next one against the edge of the post.

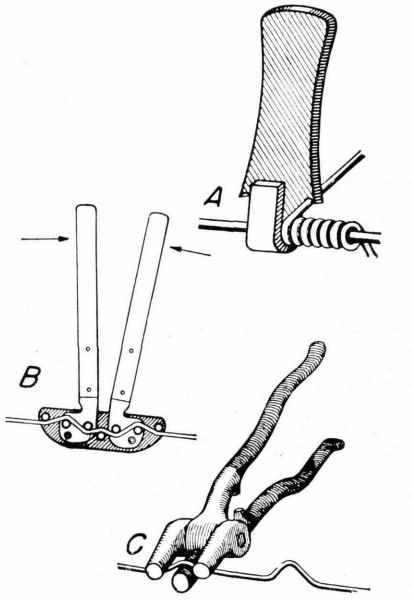

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***Figure 18.*—Fencing tools: *A*, Splicing tool; *B*, double-crimp tool; *C*, single-crimp tool.**

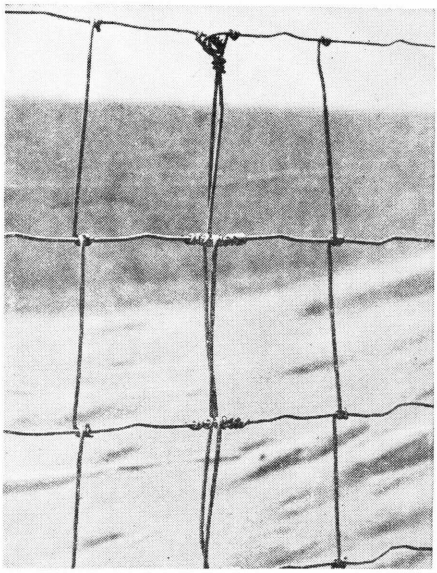

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***Figure 19.*—Western Union method of splicing woven wire.**

Starting with the center wire, wrap the end of each wire around the post and back onto the line wire. Make five wraps around the line wire, using the splicing tool (fig. 18, *A*). Keep the stay wire against the edge of the post at all times.

Unroll the fence, keeping the bottom wire close to the post. The fence should be on the "livestock side" of the posts to prevent staples from being pulled by the crowding of the livestock. (Along highways, the fencing is usually placed on the "highway side" of the posts to permit stretching without interference of cross fences.)

Attach the stretcher unit to the fence (fig. 20). Fasten it securely to prevent slippage. Space the jacks of a double-jack unit so that the line wires are divided equally between them. If you use a single-jack unit, place jack about 1 inch below center of the fencing.

Before stretching the fence, prop it against the posts with temporary stakes. Place the stakes under the top wire and lean them slightly out and away from the direction of pull. At ridges, use two props to support the fence and keep it from crowding down on the ground.

Stretch the fence. Check it during the operation to make sure that it is riding free at all points. The fence is properly stretched when it is springy to the touch and the tension curves are about half straightened out. Be careful not to overstretch it. If the tension curves are straightened out too much, there will be no provision for expansion or contraction with changes in temperature.

Fasten the fence to posts on ridges and in low places. Fasten the line wires one at a time, starting at the tight edge of the fencing.

Fasten the fence to the corner-post or endpost assembly. Secure each line wire with two staples

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***Figure 20.*—Stretching woven-wire fencing.**

angled in opposite directions to prevent slippage. Drive staples tight.

Measure the circumference of the end or corner post. Cut the wire, allowing that many inches plus at least 5 inches for wrap around the line wire. Be sure to leave enough wire—cutting wire off the end is easier than splicing more on.

Remove the last two stay wires; the next one will be placed against the post. Fasten the line wires to the post working from the center wire to the lower and upper wires. Wrap ends of the wires around line wires, using the splicing tool (fig. 18, *A*).

Stretching Barbed Wire

These instructions apply specifically to stretching barbed wire above woven wire. However, general details apply also to stretching barbed wire fences.

In a combination barbed- and woven-wire fence, barbed wire is attached after woven wire is in place.

Before unrolling barbed wire, attach one end to the gatepost or end post. Two men can unroll a reel of wire by placing a rod through the center of the reel and letting it unroll as they walk down the fence line. Two or more reels can be unrolled by placing them on an end-gate rod in the back of a truck or wagon. Tractor attachments for winding and unwinding the wire are available.

You can stretch barbed wire with an ordinary block-and-tackle stretcher equipped with a barbed wire clamp. If no clamp is available, make a loop in the end of the wire and hook onto the stretcher.

Proper spacing of the barbed wire above the woven wire is important. Figure 5 shows recommended spacing of one or more strands of barbed wire above woven wire.

Safety Precautions

Observe these safety precautions when you build fences:

- Wear heavy gauntlet leather gloves to protect hands and wrists, boots or high shoes to protect legs and ankles, and tough, closefitting clothing.
- Unroll barbed wire straight. Do not pull it off the end of the spool.
- Do not use a tractor or truck to stretch woven-wire or barbed-wire fencing. This is not only very dangerous, but it is harder to stretch the fence properly.
- When stretching barbed-wire or woven-wire fencing, stand on the opposite side of the post from the wire.
- Carry staples in a metal container or apron, not on your person.
- If you have handled treated posts, do not rub hands or gloves on the face or skin; some people are allergic to the preservative compounds.
- Don't burn fence rows with wire fence in place. The fire and heat may damage the temper of the wire and burn off the galvanizing.
- When burning old fence rows, pick a quiet day without wind.
- Build safe stiles or passageways to avoid having to climb fences.

Contour Fencing

Construction of contour fences is not difficult; in fact, it is easier than building a straight fence over

uneven ground. Following is the recommended procedure:

Stake out a smooth curve along the contour strip or terrace, spacing stakes 16½ feet apart.

Check curvature of the fence line at different points to determine if posts will have to be spaced closer than 16½ feet. To check curvature, select three consecutive stakes and stretch a string between the first and third ones. Measure distance from the center stake to the string as shown in figure 21. If the distance is 4 inches or less, posts may be spaced 16½ feet apart. If the distance is more than 4 inches, they should be spaced as follows:

Distance from center stake to string	*Post spacing*
Inches	*Feet*
4 to 5	15
5 to 6	14
6 to 8	12
8 to 14	10
14 to 20	8

Replace stakes at the correct spacing. Check by eye to see that no stake is out of line of a smooth curve. Posts must be in line for the fence to pull equally against each.

Place wire on the outside of the curve so that it will pull against the posts.

Usually you can stretch a 20- to 40-rod section of fence. However, on sharp curves, it may be necessary to stretch in 10-rod sections.

Fasten end of the wire to the end post. Unroll wire on the ground along the fence line. Pull it up by hand until it clings to the posts. Attach stretcher and apply only moderate tension; curved fences need less tension than straight ones. Walk along the fence several times during the stretching operation and release it where it may have caught on posts.

Where curvature of the fence changes materially, it is a good idea to start one end of a roll at the sharpest point on the curve and attach the stretcher at the other end. When stretched this way, the wire at the sharpest part of the curve will have less tension than it would have if the stretcher were attached elsewhere.

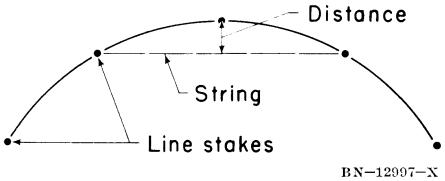

***Figure 21.*—Method of measuring curvature of contour fence line.**

Fence-Erecting Machine

A fence-erecting machine that may be operated by two or three men is in the prototype stage.

The machine is designed for use with an ordinary farm tractor. Tests show that a three-man crew with the machine can erect about 1 mile of fence a day (two to three times faster than if the fence were erected manually).

Operations performed by the machine include driving posts, unreeling woven and barbed wire, stretching fencing, and splicing.

Lightning Protection

Livestock may be killed by lightning carried along a fence. Wire fences attached to trees or buildings are most likely to receive and carry lightning discharges, but any ungrounded or improperly grounded wire fence with wood or steel posts is a hazard.

Wire fences may be grounded by attaching a piece of ¾-inch galvanized-steel pipe to wood posts at 150-foot intervals. Drive the pipe 5 feet into the ground and extend it a few inches above the post. Fasten it to the post with pipe hanging straps so that it contacts all fence wires.

GATES

Some of the many types of gates used on farms are shown in figure 22. Choice depends on use and personal preference.

Construction

Well-built gates, properly hung and braced, save time in operation and reduce maintenance costs.[4] Lightweight gates are easier to operate than heavy ones, but, if too light, are more easily broken by livestock and vehicles. Barnyard and paddock gates must be strong enough to withstand frequent shocks from livestock.

Common heights of gates are 48, 50, and 55 inches. Common widths are 8, 10, 12, 14, and 16 feet. However, width will depend on the number and kind of livestock and the kind of vehicles to be driven through the gate.

Gates are braced to prevent sagging and racking. Different methods of bracing gates are shown in the various illustrations. Braces in wooden gates should be held securely with bolts and well-clinched nails.

Use substantial gateposts of sufficient diameter and length. Set the posts at least 4 feet in the ground and anchor them firmly. Gateposts may creep or spread apart from the combined action of frost, gate weight, and fence tension. To prevent creeping, they may be permanently tied together.

Lag screws are not recommended for hinge anchors. If water rots and weakens the wood, they may pull out. Hook bolts extending through the post are more satisfactory.

[4] Construction plans for farm gates are available from your State agricultural extension service.

Cattle Guards

Cattle guards (fig. 23) facilitate the passage of vehicles through fence lines, while restraining stock.

Cattle guards strong enough for trucks may be built with discarded steel rails or small I-beams or with pipes 2 to 3 inches in diameter spaced 6 to 9 inches on center.

Cattle guards should be at least 8 feet wide, although that width may not restrain all animals. Goats and sheep may walk across a guard if a smooth path 2 inches or more in width is provided. Wire or metal wings prevent them from going around the ends.

A guard should have a pit 12 to 18 inches deep under the grating. Proper drainage of the pit is important. Crankcase oil may be used to control mosquitoes and weeds in the pit.

Semiautomatic Gates

Semiautomatic gates facilitate the passage of vehicles through fence lines.

Semiautomatic gates are of three types—swinging, tilting, and sliding. They may be operated by a pull rod (fig. 24) or by a lever or cam operated by the vehicle.

Swinging, or bumper, gates must be carefully operated to avoid damage to the vehicle or gate.

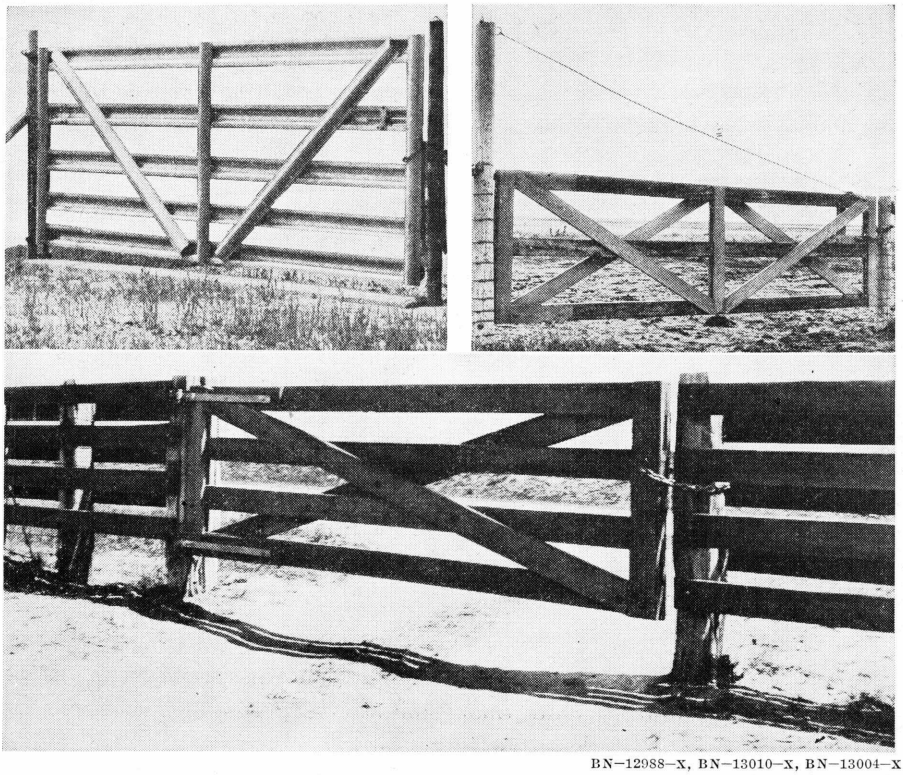

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***Figure 22.*—Farm gates. *Top left:* Strong, lightweight aluminum gates are available in many designs and sizes. *Top right:* A wire or rod from the gatepost to the swinging end of the gate reduces strain on hinges and reduces sagging. *Bottom:* Planks nailed to gateposts and fenceposts protect wire fencing when livestock pass through gate.**

Entrances

A well-designed entrance adds to the attractiveness of the farm (fig. 24).

Stone, brick, or concrete or combinations of these materials may be used to build entrances. Gates that swing both ways generally are used.

Entrances must be well drained to prevent erosion and to permit all-weather use. Approaches should have curves with an inner radius of not less than 30 feet.

Safety is an important factor in the construction of entrances, especially if the entrance is to a main highway. A vehicle driver must have full view of the highway and oncoming traffic.

The gate of an entrance to a field from a roadway should be set back from the fence line far enough to provide standing room for vehicles or farm equipment. Level entrances are safer than sloping ones.

Floodgates

Floodgates should be installed where fences cross ditches, gullies, and streams (fig. 25). They pre-

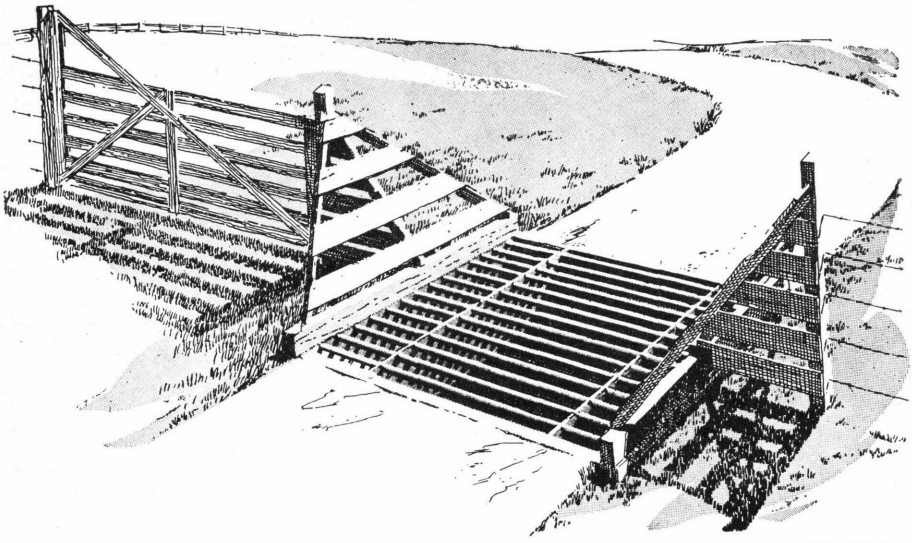

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***Figure 23.*—Cattle guards restrain stock and permit vehicles to cross fence lines.**

vent stock from swimming or crawling under the fence, and prevent debris from forming a dam that might wash out the fence or back up water to flood fields or other property.

Two important requirements for floodgates are strong anchor posts on each bank and prevention of bank erosion.

Always clear floodgates of debris after a storm. This is especially

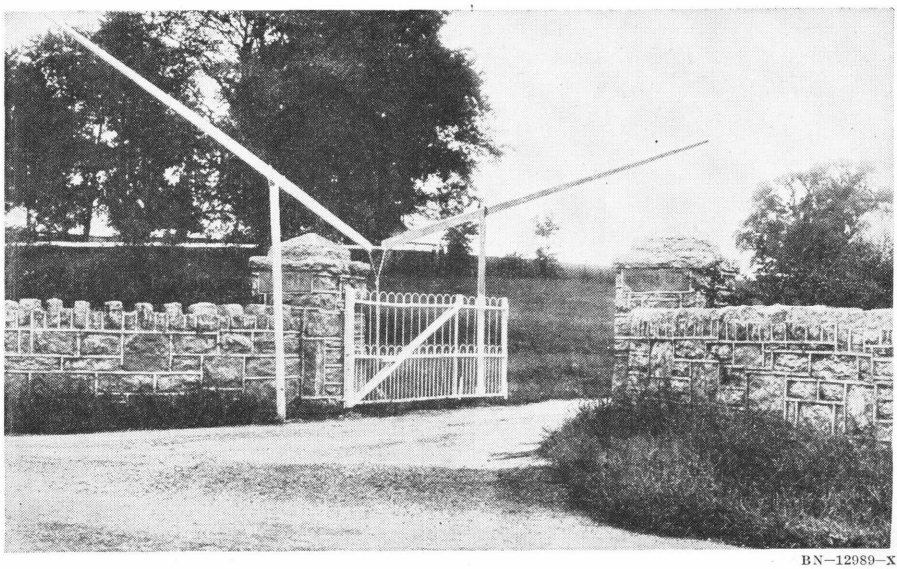

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***Figure 24.*—An attractive farm entrance with a semiautomatic gate.**

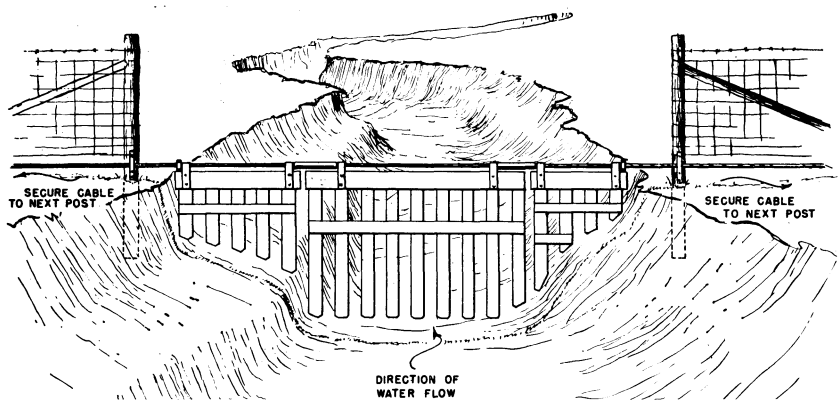

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***Figure 25.*—One type of floodgate.**

important where the stream flows through woodland.

MAINTENANCE

Keep your fences in good repair; they will give better service and last longer.

Spring and fall are the best times to inspect, repair, relocate, or remove fences.

Removal and re-use of wire is sometimes a problem in moving a fence line. Removal of lower wires first usually results in less tangling of the wire. Old barbed wire may be rolled on barrels. Old wire that is unsatisfactory for re-use should be staked in ditches to decrease soil erosion. Never leave it in fence corners or other places where it will be a menace to livestock.

Sound posts may be hard to pull when relocating fence lines. Post pullers may be purchased or homemade pullers such as those shown in figure 26 may be used.

Soil along highways sometimes erodes and slides into the ditch, making it necessary to shift the fence line. Planting vines or shrubs to reduce soil erosion may help.

It is a good idea to have a highway fence line seeded to grass or hay crops, which keep down weeds and can be mowed easily.

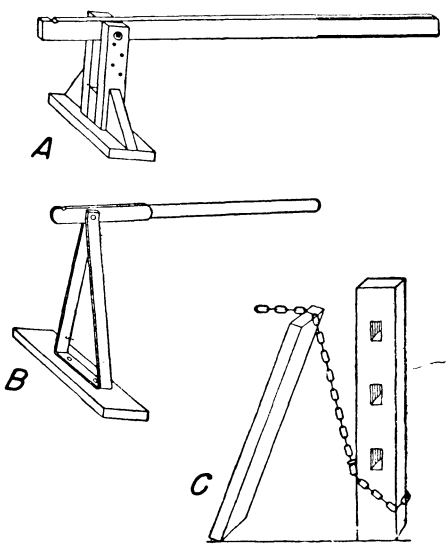

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***Figure 26.*—Equipment for pulling fenceposts: *A*, Homemade woodframe puller; *B*, puller made of steel; *C*, chain and pole for use with a team or tractor.**

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